

REMARKS

The Office Action dated August 8, 2006, has been received and carefully noted. The following remarks are submitted as a full and complete response thereto.

Claims 26-45 are pending and respectfully submitted for consideration.

Rejections Under 35 U.S.C. § 103

Claims 31, 33-34 and 37-40 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Asakawa et al. (U.S. Patent No. 5,795,385, "Asakawa") in view of Zhang et al. (U.S. Patent No. 5,766,344, "Zhang"). Claim 31 depends from claim 33 and claims 33, 34 and 37-40 are independent.

Claims 26-30, 35, 36 and 41-45 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Asakawa in view of Zhang and further in view of Selvakumar et al. (U.S. Patent No. 5,633,194, "Selvakumar"). Claims 35 and 36 are independent. Claim 26 depends from claim 33, claim 27 depends from claim 35, claims 28 and 29 depend from claim 37, claim 30 depends from claim 36, claim 41 depends from claim 34, claim 42 depends from claim 36, claims 43 and 44 depend from claim 38, and claim 45 depends from claim 39.

Claim 32 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Asakawa in view of Zhang and further in view of Ahn et al. (U.S. Patent No. 5,470,619, "Ahn"). Claim 32 depends from claim 33.

Asakawa discloses an apparatus for forming a single-crystalline thin film of a prescribed material on a substrate, comprising film forming means for forming an amorphous or a polycrystalline thin film of the prescribed material on the substrate by supplying a reaction gas, irradiation means for irradiating the substrate with gas beams

of low energy levels and a substrate rotating means for rotating the substrate. The apparatus comprises substrate rotating means, whereby it is possible to facilitate formation of an amorphous or polycrystalline thin film by intermittently applying the beams while regularly supplying the reaction gas and rotating the substrate during application pauses. See column 11, line 55 to column 12, line 4 of Asakawa. Asakawa further discloses that the irradiation means preferably comprises an electron cyclotron resonance type ion source, and the gas beams are supplied by the ion source. See column 12, lines 47-49 of Asakawa.

Zhang discloses a method for forming a semiconductor, wherein the processes from the film forming to the laser irradiation may be effected in succession, without a transfer of sample, by using such plasma CVD apparatus as is provided with a high vacuum exhausting device having a window of quartz, etc., so that a laser can be irradiated from the outside, instead of the chamber being exclusively used in the laser annealing.

Selvakumar discloses low temperature ion-beam assisted deposition methods for realizing SiGe/Si heterostructure wherein in-situ cleaning of the substrate surface was done by argon ion bombardment prior to the start of deposition.

Ahn discloses a washed substrate placed in a PECVD chamber or a LPCVD chamber and heated at a temperature sufficient to degas it, for example, at about 400°C. The degassed substrate is heated ranging from room temperature to 600°C in the atmosphere of a source gas to deposit an amorphous silicon thin film thereon. As a source gas, Si₂H₆ gas is preferably used over SiH₄ gas. However, SiH₄ gas which is

less expensive than Si₂H₆ gas, for example, Ar-, He-, H₂- or N₂-diluted SiH₄ gas, can be used as a source gas. See column 3, lines 38-50 of Ahn.

With respect to independent claims 33-40, the Applicants respectfully submit that the combination of Asakawa and Zhang fails to disclose or suggest the claimed features of the invention. With respect to claims 35 and 36, the Applicants further submit that Selvakumar fails to cure the deficiencies in Asakawa and Zhang. With respect to claim 32, the Applicants submit that Ahn fails to cure the deficiencies in Asakawa and Zhang.

Claims 33 and 34 recite forming a pre-film having crystallinity. Claims 35 and 36 recite forming the pre-film which has a microcrystalline nucleus layer of silicon. Claims 37 and 38 recite forming the pre-film having a microcrystalline nucleus layer of silicon. Claims 39 and 40 recite forming a pre-film having a microcrystalline nucleus layer. As such, each of claims 33-40 recites that the formation of the pre-film or the crystalline silicon film on the target surface of the substrate by the film forming device, while emitting the ion beam to the target surface of the substrate from an ion source forms a pre-film having a crystallinity.

In contrast, Asakawa discloses a method of forming a single-crystalline thin film forms a single-crystalline thin film of a prescribed material on a polycrystalline substrate or an amorphous substrate using plasma chemical vapor deposition by supplying a reaction gas onto the substrate under a low temperature allowing no crystallization of the prescribed material with the plasma chemical vapor deposition alone. See column 4, lines 54-61 of Asakawa. As such, Asakawa teaches the opposite method from that recited in claims 33-40 where a pre-film is formed with crystallinity.

Zhang fails to cure the deficiencies in Asakawa as Zhang also discloses preventing the film from being arisen of a silicon cluster, i.e., a part having a crystal, in the film forming process to the utmost. See column 5, lines 39-42 of Zhang. Zhang further discloses that even if a little of crystalline part was contained in the non-crystalline silicon film, it gave a bad influence on the crystallization in the later laser irradiation process. See column 5, lines 42-47 of Zhang. As such, both Asakawa and Zhang teach away from a pre-film having a crystallinity as recited in independent claims 33-40.

Selvakumar and Ahn further fail to teach or suggest the feature of locating a substrate in a film forming vacuum and forming a pre-film of a crystalline silicon film on a target surface of the substrate by a film forming device while emitting the ion beam to the target surface of the substrate from the ion source to form the pre-film having a crystallinity.

Under U.S. patent practice, to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. See M.P.E.P. § 2142.

In view of the above, the Applicants respectfully submit that Asakawa, Zhang, Selvakumar and Ahn, either singly or in combination, fail to disclose or suggest the claimed features of the invention. As such, the Office Action has failed to establish a

prima facie case of obviousness for purposes of a rejection of claims 26-45 under 35 U.S.C. § 103.

Conclusion

Claims 26, 31 and 32 depend from claim 33; claim 41 depends from claim 34; claim 27 depends from claim 35; claims 30 and 42 depend from claim 36; claims 28 and 29 depend from claim 37; claims 43 and 44 depend from claim 38; claim 45 depends from claim 39.

The Applicants respectfully submit that these dependent claims incorporate the patentable aspects thereof and are allowable for at least the same reasons. Accordingly, the Applicants respectfully request withdrawal of the rejections, allowance of claims 26-45, and the prompt issuance of a Notice of Allowability.

Should the Examiner believe anything further is desirable in order to place this application in better condition for allowance, the Examiner is requested to contact the undersigned at the telephone number listed below.

In the event this paper is not considered to be timely filed, the Applicants respectfully petition for an appropriate extension of time. Any fees for such an extension, together with any additional fees that may be due with respect to this paper,

may be charged to counsel's Deposit Account No. 01-2300, referencing Attorney Dkt.
No. 107351-00011.

Respectfully submitted,



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